Taxes, Financing Decisions, and Firm Value

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ABSTRACT

We use cross-sectional regressions to study how a firm's value is related to dividends and debt. With a good control for profitability, the regressions can measure how the taxation of dividends and debt affects firm value. Simple tax hypotheses say that value is negatively related to dividends and positively related to debt. We find the opposite. We infer that dividends and debt convey information about profitability (expected net cash flows) missed by a wide range of control variables. This information about profitability obscures any tax effects of financing decisions.

Taxes are potentially an important consideration in a firm's financing decisions. Consider, for example, the extreme case in which capital gains on common stock are priced as if they are tax-free but the marginal personal tax rate built into the pricing of dividends is 50 percent. The cost of capital of an all-equity firm that does not pay dividends is then half that of an otherwise equivalent all-equity firm whose stock returns are expected to occur only through dividend payments. Similarly, corporations faced top marginal tax rates of approximately 50 percent during much of our sample period. If corporate interest payments are priced as if they are untaxed at the personal level, a 50 percent corporate tax saving on interest deductions can make the cost of debt as little as half that of equity, even when the equity pays no dividends. In short, good estimates of how the tax treatment of dividends and debt affects the cost of capital and firm value are a high priority for research in corporate finance.

Despite the importance of the issue, there is little convincing evidence on how taxes affect the pricing of dividends and debt. Elton and Gruber (1970) find that, as predicted by the hypothesis that personal taxes make dividends less valuable than capital gains, stock prices fall by less than the full amount of the dividend on ex-dividend days. Eades, Hess, and Kim (1984) argue, however, that taxes do not explain this result. They find that the ex-dividend day price drop for stock dividends is also less than the amount of the dividend, even though stock dividends have no tax consequences.

A negative tax effect in the pricing of dividends predicts a positive relation between expected stock return and the proportion of the expected return received as a dividend, usually proxied by the dividend/price ratio, D/P. In

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tests of this prediction (Black and Scholes (1974), Litzenberger and Ramaswamy (1979), Blume (1980), and Miller and Scholes (1982)), the results are sensitive to the way D/P is measured, and no consensus emerges.

To our knowledge, exchange offers produce the only evidence that corporate debt may have large tax benefits that increase firm value. Masulis (1980) finds that exchanges of debt for equity produce higher stock prices, while exchanges of equity for debt lower stock prices. But there is reason to question whether taxes explain Masulis's results. It is well known that new equity issues lower stock prices (Masulis and Korwar (1986)), but equity repurchases raise stock prices (Vermaelen (1981)). These results are usually explained in terms of the Myers–Majluf (1984) hypothesis that firms tend to issue equity when it is overvalued, so new issues meet with price discounts. The conclusion that the information effects of changes in equity, rather than the tax effects of changes in debt, explain Masulis's strong results on exchange offers is reinforced by the evidence that increases in debt that do not involve reductions in equity produce weak stock price responses (Eckbo (1986)).

The fact that yields on corporate bonds are higher than yields on nontaxable bonds seems to support Miller's (1977) hypothesis that there is a personal tax discount in the pricing of corporate interest payments that can eliminate the corporate tax benefit of debt. The taxable–nontaxable yield spread is not, however, much evidence about the effects of personal taxes on corporate bond prices. Before 1986, banks were allowed to deduct interest payments on debt issued to purchase tax-free municipal bonds. Arbitrage by banks ensured that short-term interest rates on municipals differed from short-term taxable rates by the corporate tax rate (Skelton (1983)). This arbitrage relation holds regardless of the tax bracket built into the pricing of taxable interest. Likewise, investors in high tax brackets can rationally hold tax-free bonds at lower yields than taxable bonds, whatever the tax bracket implicit in the pricing of taxable interest.

Finally, Mackie-Mason (1990) and Graham (1996) find that firms with high marginal tax rates are more likely to issue debt than firms with low marginal tax rates. But this does not necessarily imply that debt increases firm value. Even in Miller's (1977) world, where there is no relation between debt and firm value, firms issue debt only when they expect to use the interest deduction to offset taxes.

We use cross-sectional regressions of firm value on earnings, investment, and financing variables to measure tax effects in the pricing of dividends and debt. Our approach is based on the simple observation that the market value of a firm is (i) the market value of an all-equity no-dividends firm with the same pretax expected net cash flows (cash earnings before interest, dividends, and taxes, less investment outlays), plus (ii) the value of the tax effects of the firm's expected dividend and interest payments. It follows that if other variables in our cross-sectional regressions capture all the information about expected net cash flows in financing decisions, then the slopes on dividend and debt variables isolate tax effects.
We use a wide range of variables (past, current, and future earnings, investment, and research and development (R&D) expenditures) to proxy for expected net cash flows. Despite our best efforts, our regressions produce no reliable evidence of tax effects. The estimated marginal relation between firm value and dividends is positive. Since there is no reason to expect a positive tax effect in the pricing of dividends, we infer that dividends convey information about profitability (expected net cash flows) missed by the control variables. Our attempts to identify the tax benefits of leverage meet similar identification problems. In regressions meant to control for pretax expected net cash flows, the marginal relation between leverage and value is typically negative, rather than positive. With a stretch, our results can be interpreted in terms of Miller’s (1977) hypothesis that leverage has no net tax benefits because personal taxes on interest offset the corporate tax savings. It seems more likely, however, that, as with dividends, leverage conveys information about profitability that is missed by the control variables. The bottom line, then, is that our regressions fail to measure how (or whether) the tax effects of financing decisions affect firm value. The relations between financing decisions and value we observe are unidentified mixes of tax effects and factors that affect profitability.

For readers tempted to fold their cards, we emphasize that other approaches to measuring the effects of financing decisions on firm value face similar identification problems. For example, event studies (the reigning alternative) can only isolate tax effects if they control for the information about profitability that occurs with dividend or debt announcements. Without such controls, the responses of stock prices to financing decisions observed in event studies are hodgepodges of tax effects and any other factors that induce a correlation between financing decisions and value.

Though they face similar problems, our cross-sectional regressions have advantages over event studies. Event studies can only measure the effects of unexpected changes in financing decisions. Our regressions to explain the level of firm value measure the fully anticipated effects of a firm’s known financing strategies. Although they are more similar to event studies, our regressions to explain the change in firm value focus on longer-term (two-year) changes in value and financing decisions. Perhaps as a result, the value effects we observe are larger and more reliable than those of event studies.

Although we fail to measure the tax effects of financing decisions, there is a strong positive aspect to our results. Because our regressions control for earnings, dividends, debt, and investment, they give a striking picture of the richness of the information about value in investment and financing decisions. Dividends have information about value missed by earnings, investment, and debt. Event studies typically find that announcements of changes in debt have little effect on stock prices (see, for example, Eckbo (1986)). In contrast, our cross-sectional regressions show that the level of leverage and longer-term changes in debt have reliable information about value missed by earnings, investment, and dividends. Finally, investment has information about value missed by earnings and financing variables.
Section I describes the mechanics of the cross-sectional regression approach to measuring the relations between value and financing decisions. Section II outlines the theories about the tax effects of financing decisions and discusses why the regressions can potentially measure tax effects. The regression results are in Sections III and IV. Section V concludes.

I. The Regression Approach

The dependent variable in our cross-sectional regressions is the spread of value over cost, $V_t - A_t$, where $V_t$ is the total market value of a firm and $A_t$ is the book value of its assets. We also attempt to explain the two-year change in the spread, $d(V_t - A_t) = (V_t - A_t) - (V_{t-2} - A_{t-2})$. The explanatory variables include past, current, and future values of dividends, interest, earnings, investment, and R&D expenditures. In the spirit of Fama and MacBeth (1973), we base our inferences on the average slopes from regressions estimated separately for each year $t$ of our 1965 to 1992 sample period.

Using $V_t - A_t$ as the dependent variable in cross-sectional regressions creates problems. The results are likely to be dominated by the largest firms, and heteroskedasticity is likely to cloud inferences. The two-year change in the spread, $d(V_t - A_t)$, poses similar problems. Our solution is to scale both the dependent and the explanatory variables in our regressions by total book assets, $A_t$. (We would prefer to measure assets at replacement cost, but we do not have the necessary data.) When the dependent variable is $(V_t - A_t)/A_t$, the cross-sectional regression that contains all (similarly scaled) explanatory variables is

$$
(V_t - A_t)/A_t = a + a_1 E_t/A_t + a_2 dE_t/A_t + a_3 dE_{t+2}/A_t + a_4 dA_t/A_t
+ a_5 dA_{t+2}/A_t + a_6 RD_t/A_t + a_7 dRD_t/A_t + a_8 dRD_{t+2}/A_t
+ b_1 I_t/A_t + b_2 dI_t/A_t + b_3 dI_{t+2}/A_t + b_4 D_t/A_t
+ b_5 dD_t/A_t + b_6 dD_{t+2}/A_t + c_1 dV_{t+2}/A_t + e_t. \tag{1}
$$

$I_t$ is interest expense for fiscal year $t$, $D_t$ is total dividends paid, $RD_t$ is R&D expenditures, and $E_t$ is earnings before interest and extraordinary items but after depreciation and taxes. (We also show regressions that use pretax earnings.) To simplify the notation, we omit the firm subscript that should appear on all variables in regression (1) and the year subscript $t$ that should appear on all regression coefficients. Likewise, $dX_t$ is compact notation for the two-year change, $X_t - X_{t-2}$. Note that $dX_t/A_t$ is the change in $X_t$ scaled by total assets, $(X_t - X_{t-2})/A_t$. We use $d(X_t/A_t)$ to denote the change in the ratio, $X_t/A_t - X_{t-2}/A_{t-2}$.

To measure the tax effects of financing decisions, the regressions must control for profitability, that is, expected net cash flows. The current, past, and future earnings variables, $E_t/A_t$, $dE_t/A_t$, and $dE_{t+2}/A_t$, in regression (1)
are meant to capture the profits part of expected net cash flows. $E_t/A_t$ measures the current level of profits, and $dE_t/A_t$ and $dE_{t+2}/A_t$ are meant to proxy for the expected growth of profits. Using a two-year future change in earnings, $dE_{t+2}/A_t$, is in line with the evidence in Fama (1990) that two years is about as far ahead as the market can predict. The past and future two-year changes in assets, $dA_t/A_t$ and $dA_{t+2}/A_t$, are meant to proxy for the net investment component of expected net cash flows. We include the R&D variables, $RD_t/A_t$, $dRD_t/A_t$, and $dRD_{t+2}/A_t$, because mandatory expensing of R&D causes assets to be understated and $V_t - A_t$ to be overstated if R&D expenditures have multiperiod payoffs. The investment and R&D variables can also pick up information about expected profits missed by the earnings variables.

In tax stories about financing decisions, the levels of expected future dividends and interest payments affect firm value; that is, the tax disadvantage of dividends and the tax advantage of debt depend on dollars of expected dividends and interest. Thus, $D_t/A_t$ and $I_t/A_t$ in regression (1) are meant to capture the level of dividends and interest. The past and future changes, $dD_t/A_t$, $dD_{t+2}/A_t$, $dI_t/A_t$, and $dI_{t+2}/A_t$, are meant to proxy for the expected growth of dividends and interest. As we do for the other explanatory variables in regression (1), we scale the dividend and interest variables by $A_t$ to put them in the same units as the dependent variable, $(V_t - A_t)/A_t$.

It is possible that changes in dividend and leverage policy—as opposed to changes in the level of dividends and interest—convey information about expected dividend and interest payments. Thus, it is interesting to examine regressions that use changes in dividend and leverage policy to explain firm value. The usual proxy for a firm’s dividend policy is its target ratio of dividends to earnings (Lintner (1956)). Estimating the target as the current ratio of dividends to earnings leads to problems. The ratio is meaningless when earnings are negative, and it can explode when earnings are close to zero. An alternative is the dividend/price ratio, but that ratio seems inappropriate since price is basically the variable that regression (1) seeks to explain. Instead, we interpret $D_t/A_t$ as both the scaled dividend payment and a noisy proxy for dividend policy, and we use the change in the ratio, $d(D_t/A_t) = D_t/A_t - D_{t-2}/A_{t-2}$, as a proxy for changes in dividend policy. Similarly, we interpret $I_t/A_t$ as both the scaled interest payment and a proxy for leverage policy, and we use the change in the ratio, $d(I_t/A_t) = I_t/A_t - I_{t-2}/A_{t-2}$, to proxy for changes in leverage policy. The regression using the leverage and dividend policy variables is then

$$
(V_t - A_t)/A_t = a + a_1 E_t/A_t + a_2 dE_t/A_t + a_3 dE_{t+2}/A_t + a_4 dA_t/A_t \\
+ a_5 dA_{t+2}/A_t + a_6 RD_t/A_t + a_7 dRD_t/A_t + a_8 dRD_{t+2}/A_t \\
+ b_1 I_t/A_t + b_2 d(I_t/A_t) + b_3 d(I_{t+2}/A_{t+2}) + b_4 D_t/A_t \\
+ b_5 d(D_t/A_t) + b_6 d(D_{t+2}/A_{t+2}) + c_1 dV_{t+2}/A_t + e_t. \tag{2}
$$
Though we do not have an alternative, we do not think \( D_t/A_t \) is a good proxy for dividend policy. For example, dividends and \( D_t/A_t \) can change in response to a change in profits on existing assets without implying a change in the target payout. Differences in leverage can also produce cross-firm variation in \( D_t/A_t \) that has nothing to do with dividend policy. (This problem is at least partially mitigated by including leverage among the explanatory variables.) We are more comfortable with \( I_t/A_t \) as a measure of leverage policy. \( I_t/A_t \) is a direct measure of book leverage. If the agency costs of debt are high for intangible assets such as future growth opportunities (Myers (1977)), then target leverage may be closely related to book leverage. Thus, though still noisy, book leverage is probably informative about leverage policy.

The explanatory variables in regressions (1) and (2) include changes from \( t \) to \( t+2 \) in the earnings, investment, and financing variables. Only expected changes can affect the time \( t \) spread of value over cost, \((V_t - A_t)/A_t\). Following Kothari and Shanken (1992), we use the two-year change in market value, \( dV_{t+2}/A_t = (V_{t+2} - V_t)/A_t \), to purge other future changes of their unexpected components. To illustrate the logic, suppose the expected change in earnings from \( t \) to \( t+2 \) has a positive effect on \((V_t - A_t)/A_t\), and the unexpected part of \( dE_{t+2}/A_t \) has a positive effect on \( V_{t+2} \). The Kothari--Shanken argument then says that the slope on \( dV_{t+2}/A_t \) in regression (1) should be negative. Intuitively, the slope on \( dV_{t+2}/A_t \) offsets the error in the realized change in earnings as a measure of the expected change. Similar logic says \( dV_{t+2}/A_t \) can also offset the unexpected components of the future changes in assets, dividends, and debt. However, the two-year change in market value, \( dV_{t+2}/A_t \), is not perfectly correlated with any of these unexpected components, so measurement error is a lingering problem in the regressions. (These comments also apply to \( dV_{t+2}/A_t \) in the change regressions, discussed next.)

When the dependent variable in the cross-sectional regressions is the two-year change in the spread of value over cost, \((V_t - A_t)/A_t = ((V_t - A_t) - (V_{t-2} - A_{t-2}))/A_t \), all explanatory variables are also changes. The change regressions are otherwise similar to the level regressions (1) and (2). Specifically, the change regressions that contain all explanatory variables are

\[
d(V_t - A_t)/A_t = a + a_1dE_t/A_t + a_2dE_{t+2}/A_t + a_3dA_t/A_t + a_4dA_{t+2}/A_t + a_5dRD_t/A_t + a_6dRD_{t+2}/A_t + b_1dI_t/A_t + b_2dI_{t+2}/A_t + b_3dD_t/A_t + b_4dD_{t+2}/A_t + c_1dV_{t+2}/A_t + e_t,
\]

and

\[
d(V_t - A_t)/A_t = a + a_1dE_t/A_t + a_2dE_{t+2}/A_t + a_3dA_t/A_t + a_4dA_{t+2}/A_t + a_5dRD_t/A_t + a_6dRD_{t+2}/A_t + b_1d(I_t/A_t) + b_2d(I_{t+2}/A_t) + b_3d(D_t/A_t) + b_4d(D_{t+2}/A_t) + c_1dV_{t+2}/A_t + e_t.
\]
To be included in regressions (1) to (4) for year \( t \), the month of a firm’s fiscal year-end must not have changed from \( t - 2 \) to \( t + 2 \), and the firm must have the relevant COMPUSTAT data for fiscal years \( t - 2 \), \( t \), and \( t + 2 \). The potential for survivor bias is apparent. Note, however, that survival requirements would be more severe if we were to estimate regressions (1) to (4) as time-series regressions for individual firms. Indeed, one advantage of year-by-year cross-sectional regressions is that they do not require that firms survive for long periods, so they are less subject to survivor bias and can cover many more firms than time-series regressions. On the other hand, the slopes in time-series regressions can differ across firms, a flexibility lost in the cross-sectional regressions.

It is worthwhile to compare the interpretations of the level and change regressions. The spread of value over cost, \( \frac{V_t - A_t}{A_t} \), depends only on information available at time \( t \), that is, the firm’s past and expected future investment and financing decisions. Thus, the level regressions (1) and (2) attempt to measure the relations between value and things known or expected at \( t \). However, because \( V_{t-2} \) captures the value of everything known about the firm at \( t - 2 \), the expected value of the two-year change, \( \frac{d(V_t - A_t)}{A_t} \), is close to zero.\(^1\) Thus, the change regressions (3) and (4) largely identify unexpected effects, that is, information about earnings, investment, and financing decisions available at \( t \) that was not available at \( t - 2 \). (This explains why the change regressions do not include lagged explanatory variables.) The change regressions are similar in spirit to the event studies that dominate the existing literature on how value responds to unexpected earnings, investment, and financing decisions. But the change regressions measure the cumulative effects of unexpected events over a long (two-year) horizon, whereas event studies focus on specific point-in-time announcements.

\(^1\) The change in assets from \( t - 2 \) to \( t \) is

\[
A_t - A_{t-2} = \text{Earnings before Interest} - \text{Dividends} - \text{Interest} + \text{Net Cash Flow from New Securities},
\]

where the variables on the right of the equality are for the two-year period from \( t - 2 \) to \( t \). If we assume new securities are sold at the end of year \( t \), the change in the firm’s market value from \( t - 2 \) to \( t \) is

\[
V_t - V_{t-2} = \text{Two-Year Return} \times V_{t-2} - \text{Dividends} - \text{Interest} + \text{Net Cash Flow from New Securities},
\]

and the two-year change in the spread between value and cost is

\[
(V_t - A_t) - (V_{t-2} - A_{t-2}) = \text{Two-Year Return} \times V_{t-2} - \text{Earnings before Interest}.
\]

The expected change is the difference between the expected return on the firm’s securities and the expected earnings on the firm’s assets.
Several statistical issues warrant discussion. Following Fama and MacBeth (1973), we use the time-series standard deviations of the slopes in the year-by-year cross-sectional regressions to construct standard errors for the average slopes. The main advantage of this approach is that the year-by-year variation in the slopes includes the effects of estimation error due to the cross-correlation of the residuals for individual firms. Another advantage is large samples, an average of about 2400 firms per annual regression, which increases the precision of the slopes and reduces their year-by-year volatility.

We could also adjust the standard errors of the average slopes for the sample autocorrelation of the annual slopes. The problem is that we have just 28 time-series observations on the slopes for the 1965 to 1992 sample period. The sample autocorrelations of the slopes are thus imprecise, with standard errors of about 0.19. With such imprecision, the formal cure for autocorrelation can be worse than the disease. (It is worth noting that the popular alternative to Fama–MacBeth standard errors for cross-sectional regressions, OLS estimates from pooled regressions that combine the cross sections of all years, typically ignores both the cross-correlation of the residuals for a given year and the autocorrelation across years.)

We use a less formal approach to account for the autocorrelation of the regression slopes. The dependent variable \(d(V_t - A_t)/A_t\) in the change regressions covers two years. If one-year changes are serially independent, the overlap of the two-year changes in the year-by-year regressions should induce first-order autocorrelation in the slopes of about 0.5. If this is the only autocorrelation in the year-by-year slopes, the variances of the average slopes, calculated assuming serial independence, are too small by about 50 percent, and the standard errors of the average slopes should be inflated by about 40 percent. This suggests that we should require a \(t\)-statistic of about 2.8 or perhaps 3.0, rather than the usual 2.0, to infer reliability. In fact, and without showing the details, the first-order autocorrelations of the slopes in both the level and the change regressions cluster around 0.5. Higher-order autocorrelations are more random about zero. Thus, requiring \(t\)-statistics around 3.0 for the average slopes seems reasonable.

We are also concerned that the regressions may be dominated by influential observations. The variables are scaled by assets, and this creates influential observations when assets are close to zero. Data errors can also be a problem. To address these issues, each year we drop 0.5 percent of the observations in each tail of the distribution of each explanatory variable. Because we trim each variable based on the full sample, dropping 1 percent of the observations for \(K\) variables causes us to lose fewer than \(K\) percent of the observations. For example, in the level regression (1), trimming on 15 explanatory variables causes the average number of firms in the regressions to drop by less than 9 percent, from 2612 per year to 2383. Similarly, trimming the change regression (3) on 11 explanatory variables causes the average number of firms to drop by less than 7 percent, from 2612 per year to 2439.

Trimming on explanatory variables does not affect the expected values of the regression slopes, but excessive trimming can increase their standard errors.
In fact, without showing details, the standard errors of the average slopes from the trimmed regressions are typically smaller than when the regressions use all observations. This suggests that the trimming is not excessive.

Finally, our regressions impose the same slopes on all firms. The response of value to profitability depends, however, on capitalization rates (costs of capital), which differ across firms. Since the regressions do not allow for differences in capitalization rates, there is a specification problem. To partially control for this problem, we estimate the regressions separately for six groups of firms that are sorted to have more similar within-group expected stock returns. Fama and French (1992) argue that two variables, firm size and the ratio of book equity to the market value of equity (BE/ME), describe the cross section of expected stock returns fairly well. Motivated by this evidence, each year we sort all NYSE, AMEX, and Nasdaq firms on COMPUSTAT into two size groups, based on whether a firm is above or below the median size (stock price times shares outstanding) of all NYSE firms. We also sort COMPUSTAT firms into three BE/ME groups (bottom 30 percent, middle 40 percent, and top 30 percent). The regressions are then estimated separately on the six sets of firms in the intersections of the size and the BE/ME sorts.

Besides providing a control for cross-firm variation in discount rates, these six BE/ME size groups could expose differences in the response of value to investment and financing decisions as a function of size (small versus big firms) and relative success (proxied by book-to-market-equity). In fact, without showing the details, we can report that the distributions of the dependent and explanatory variables do differ systematically across the BE/ME size groups. But the estimated responses of value to earnings, investment, and financing variables are similar across groups, and much like those in the tables below.

II. Measuring Tax Effects: The Logic

The literature suggests that many factors, including taxes, bankruptcy costs, agency costs, proxy effects, and asymmetric information, play a role in the relation between firm value and financing decisions. Apart from taxes, however, the factors linking value and financing decisions all operate through pretax profitability (net cash flows).

In agency-cost models, for example, financing decisions affect value because they produce behavior that affects profitability. Thus, Jensen and Meckling (1976) argue that higher leverage allows a firm's manager to hold a larger fraction of its common stock. This reduces agency problems by aligning the manager's interests more closely with the interests of other stockholders. Jensen (1986) argues that leverage also enhances value by forcing the firm to pay out resources that managers might otherwise waste on bad investments. Easterbrook (1984) makes a similar claim for dividends. On the other hand, Fama and Miller (1972) and Jensen and Meckling (1976) suggest that leverage increases the incentives of stockholders to make risky
investments that shift wealth from bondholders but do not maximize the combined wealth of security holders. Myers (1977) suggests that leverage can cause firms to underinvest because the gains from investment are shared with the firm’s existing risky bonds. Whether they produce benefits or costs, however, the agency effects of financing decisions work through profitability; they cause firms to make better or worse investments and to use assets more or less efficiently.

Other factors linking value and financing decisions also work through profitability. For example, the expected bankruptcy costs of leverage lower value by lowering expected profits. In the pecking-order model of Myers (1984) and Myers and Majluf (1984), asymmetric information problems that arise when issuing debt and equity cause firms to prefer internal financing. External financing, then, is bad news about earnings. In the proxy-effect model of Miller and Rock (1985), the constraint that sources equal uses of funds implies that external debt or equity financing is information that earnings are lower than expected. Similarly, the proxy-effect hypothesis of Miller and Modigliani (1961) says that dividends are related to value because dividends convey information about expected earnings beyond that in measured earnings. The bottom line in all of these models is that financing decisions are related to value because they are related to, and so are information about, profitability.

Put more precisely, the market value of a firm is the value of an all-equity no-dividends firm with the same pretax expected net cash flows (cash earnings before interest, dividends, and taxes, less investment outlays) plus the value of the personal and corporate tax effects of the firm’s dividend and debt strategies (detailed below). Nontax links between value and financing decisions work through the information in financing decisions about pretax net cash flows (profitability). This means that if the earnings, investment, and R&D variables in regressions (1) to (4) absorb the information about profitability in financing decisions, the dividend and debt slopes will isolate tax effects.

What are the hypotheses about tax effects? Before Miller and Scholes (1978), the presumption was that higher dividend payout policies result in lower stock prices because dividends are taxed at higher rates than capital gains (Brennan (1970)). Miller and Scholes (1978) argue, however, that taxes on dividends can be avoided by investing in stocks via retirement plans or by offsetting deductions of personal interest payments. In their model, dividends and capital gains are priced as if they are tax-free, and firm value is not affected by dividend policy. Still another hypothesis is that firm value is unaffected by dividend policy because pricing is dominated by investors subject to symmetric taxation of dividends and capital gains (Miller and Scholes (1982)). In short, Brennan (1970) predicts that the dividend slopes in cross-sectional regressions to explain firm value will be negative, while Miller and Scholes (1978, 1982) say they will be zero.

The hypotheses about how the tax effects of debt show up in our regressions are more complicated. In Miller (1977), common stock is priced as if it is tax-free, but the personal tax rate built into the pricing of corporate in-
terest payments is the corporate tax rate. In this world, the debt tax shield at the corporate level is offset by taxes on interest at the personal level, and debt does not affect firm value. At the other extreme, Miller and Scholes (1978) consider a scenario in which investors avoid personal taxes on all investment returns, and all corporate securities are priced as if they are tax-free. As in Modigliani and Miller (MM) (1963), the corporate debt tax shield then increases firm value by the market value of the corporate tax savings on expected interest payments.

The predictions of these hypotheses for the debt slopes in our regressions depend on whether we control for before- or after-tax profits. Consider two firms with the same pretax earnings (always before interest). In Miller (1977), the more levered firm’s higher after-tax earnings are just offset by the higher personal taxes paid by its bondholders. Given pretax earnings, there is no relation between debt and value. But if two firms have the same after-tax earnings, the more levered firm has lower value because its investors pay more taxes. Thus, controlling for after-tax earnings, the relation between debt and value is negative. In contrast, MM (1963) predict that the relation between value and leverage is positive in regressions that control for pretax earnings because pretax earnings do not capture the debt tax shield. If profits are measured after taxes, they capture the benefit of the interest deduction. Thus, controlling for after-tax earnings, there is no relation between debt and value.

We can make a rough estimate of the tax benefit predicted by MM (1963). With corporate tax rates around 50 percent during much of our sample period, and interest rates around 10 percent, the value of the corporate tax savings is about five times expected interest payments (if corporate debt is a perpetuity). Thus, the slopes on the interest variables in regressions that control for before-tax earnings should be about 5.0. Moreover, although Miller (1977) and MM (1963) make different predictions about the levels of the slopes on interest variables, they agree on the difference between the interest slopes in regressions that control for before- and after-tax earnings. The difference is the market value of the corporate tax savings on interest payments. Thus, Miller (1977) predicts zero slopes on interest variables in regressions that control for pretax earnings (versus approximately 5.0 for MM (1963)), but the interest slopes should be about −5.0 (versus zero for MM (1963)) in regressions that control for after-tax earnings.

Again, though, our regressions identify tax effects only if other explanatory variables absorb the information about profitability in financing decisions. Thus, we begin the discussion of empirical results by examining whether the variables we use to control for profitability indeed carry information about value.

III. Earnings, Investment, and R&D

Table I reports regressions that focus on one explanatory variable at a time. Although these regressions include past, current, and future values of the highlighted variable, along with a two-year future change in value, we
Table I

Average Coefficients and Their t-Statistics from Single-Variable Regressions to Explain 
\((V_t - A_t)/A_t \text{ and } d(V_t - A_t)/A_t\)

The variables (COMPUSTAT data item numbers in parentheses) are as follows. \(D_t\) is total dividends paid during fiscal year \(t\) (21). \(A_t\) is total book assets (6). \(I_t\) is interest expense (15). \(RD_t\) is R&D expenditures (46). (We set \(RD_t\) equal to zero if it is missing on COMPUSTAT.) \(E_t\) is earnings before extraordinary items (18), plus interest expense (15), plus (when available) income statement deferred taxes (50) and investment tax credit (51). \(ET_t\), earnings before taxes for year \(t\), is \(E_t\) plus tax expense (16). \(V_t\), the total value of the firm, is its common stock price (199) times shares outstanding at the end of fiscal year \(t\) (54), plus preferred stock (taken to be, in order and as available, redemption value (56), liquidating value (10), or par value (130)), plus total book liabilities (181), minus balance sheet deferred taxes and investment tax credit (35), if available. \(dX_t\) is the change in a variable from year \(t - 2\) to \(t\). For example, \(dD_t/A_t = (D_t - D_{t-2})/A_t\) and \(d(D_t/A_t) = D_t/A_t - D_{t-2}/A_{t-2}\). The cross-sectional regressions use only investment, earnings, interest, dividends, or R&D variables, along with the future change in value \((dV_{t+2}/A_t)\), as explanatory variables. The regressions are run for each year \(t\) using all COMPUSTAT firms with data for the year on all variables in any regression. The table shows means (across years) of the regression intercepts (Int) and slopes. Each \(t\)-statistic \((t(\text{mean}), \text{in parentheses})\) is a mean divided by its standard error (the times-series standard deviation of the regression coefficient divided by \(27^{1/2}\)). The time period covered by \(t\) is 1965 to 1992, 28 years.
<table>
<thead>
<tr>
<th>Dependent Variable: $(V_t - A_t)/A_t$</th>
<th>$d(V_t - A_t)/A_t = ((V_t - A_t) - (V_{t-2} - A_{t-2}))/A_{t-2}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\text{Int}$</td>
<td>$E_t/A_t$</td>
</tr>
<tr>
<td>Mean</td>
<td>-0.07</td>
</tr>
<tr>
<td>$t(\text{Mean})$</td>
<td>(-0.88)</td>
</tr>
<tr>
<td>$\text{Int}$</td>
<td>$E_{t}/A_{t}$</td>
</tr>
<tr>
<td>Mean</td>
<td>-0.03</td>
</tr>
<tr>
<td>$t(\text{Mean})$</td>
<td>(-0.53)</td>
</tr>
<tr>
<td>$\text{Int}$</td>
<td>$dA_t/A_t$</td>
</tr>
<tr>
<td>Mean</td>
<td>0.07</td>
</tr>
<tr>
<td>$t(\text{Mean})$</td>
<td>(1.65)</td>
</tr>
<tr>
<td>$\text{Int}$</td>
<td>$RDi/A_t$</td>
</tr>
<tr>
<td>Mean</td>
<td>0.21</td>
</tr>
<tr>
<td>$t(\text{Mean})$</td>
<td>(5.04)</td>
</tr>
<tr>
<td>$\text{Int}$</td>
<td>$I_t/A_t$</td>
</tr>
<tr>
<td>Mean</td>
<td>0.44</td>
</tr>
<tr>
<td>$t(\text{Mean})$</td>
<td>(7.63)</td>
</tr>
<tr>
<td>$\text{Int}$</td>
<td>$I_t/A_t$</td>
</tr>
<tr>
<td>Mean</td>
<td>0.45</td>
</tr>
<tr>
<td>$t(\text{Mean})$</td>
<td>(7.36)</td>
</tr>
<tr>
<td>$\text{Int}$</td>
<td>$D_t/A_t$</td>
</tr>
<tr>
<td>Mean</td>
<td>0.15</td>
</tr>
<tr>
<td>$t(\text{Mean})$</td>
<td>(3.04)</td>
</tr>
<tr>
<td>$\text{Int}$</td>
<td>$D_t/A_t$</td>
</tr>
<tr>
<td>Mean</td>
<td>0.13</td>
</tr>
<tr>
<td>$t(\text{Mean})$</td>
<td>(2.72)</td>
</tr>
</tbody>
</table>
The single-variable regressions in Table I show that earnings, investment, and R&D are strongly related to the spread of value over cost, \((V_t - A_t)/A_t\). When only the current level of earnings, \(E_t/A_t\), the lagged and future two-year changes, \(dE_t/A_t\) and \(dE_{t+2}/A_t\), and the two-year future change in value, \(dV_{t+2}/A_t\), are used to explain \((V_t - A_t)/A_t\), the average slopes on the earnings variables are 4.08 to 8.05 standard errors from zero. When the only explanatory variables are past and future two-year investment, \(dA_t/A_t\) and \(dA_{t+2}/A_t\), and the future change in value, the investment slopes are 10.97 and 5.06 standard errors from zero. Finally, in the single-variable regressions that use \(RD_t/A_t\), \(dRD_t/A_t\), and \(dRD_{t+2}/A_t\) to explain \((V_t - A_t)/A_t\), the average slopes on the three R&D variables are more than 4.6 standard errors from zero. Similar comments apply to the regressions to explain the two-year change in the spread of value over cost. The strong relations between value and earnings, investment, and R&D give us hope that, used together in the full regressions (1) to (4), these variables provide a control for profitability that allows us to identify tax effects in the relationship between value and financing decisions.

It is also clear from Table I, however, that the earnings variables are noisy proxies for expected profits. In the absence of noise, the earnings slopes should be capitalization factors, on the order of 10.0. But the biggest slope on an earnings variable is 4.65, and most are less than 2.0. If the full regressions are to identify the tax effects of financing decisions, investment and R&D will probably have to capture information about expected profits missed by measured earnings. We argue below that this is the case.

When earnings, investment, and R&D are used together in the full regressions (1) and (2) to explain the spread of value over cost (Table II), the slopes tend to be smaller than those in the single-variable regressions. Even in the full regressions, however, the earnings slopes are 2.43 to 8.46 standard errors from zero, the R&D slopes are 3.37 to 7.77 standard errors from zero, and the investment slopes are more than 4.6 standard errors from zero. Moreover, the investment and R&D slopes remain economically large. An additional dollar of current R&D is associated with about $4.50 of additional \(V_t - A_t\). An additional dollar of past or future two-year growth in R&D is associated with between $3.74 and $5.70 of additional \(V_t - A_t\). A dollar of past or future two-year growth in assets is associated with $0.34 to $1.16 of additional \(V_t - A_t\).

The full regressions (3) and (4) to explain the change in the spread of value over cost, \(d(V_t - A_t)/A_t\), produce roughly similar results (Table III). The slopes on current and future changes in earnings are all more than 4.75 standard errors from zero. The slopes on two-year future investment, \(dA_{t+2}/A_t\), are also strong, but current investment, \(dA_t/A_t\), shows little explanatory power. The slopes on current and future changes in R&D are 2.33 to 3.92 standard errors from zero.

Measured investment seems to provide more information about expected profits than about expected investment. With rational pricing and a perfect
Table II  
Average Coefficients and Their t-Statistics from Estimates of Regressions (1) and (2)  
to Explain the Level of \((V_t - A_t)/A_t\)

\(D_t, I_t, RD_t, E_t,\) and \(ET_t\) are, respectively, dividends paid, interest expense, R&D expenditures, earnings before interest, and earnings before interest and taxes for fiscal year \(t\). \(V_t\) and \(A_t\) are the market value of the firm and total book assets at the end of fiscal year \(t\). (See Table I for details.) \(dX_t\) is the change in a variable from year \(t-2\) to \(t\). For example, \(dI_t/A_t = (I_t - I_{t-2})/A_t\), and \(d(I_t/A_t) = I_t/A_t - I_{t-2}/A_{t-2}\). The regressions are run for each year \(t\) using all COMPUSTAT firms with data for the year on all variables in any regression. Panel A of the table shows means (across years) of the regression intercepts (Int) and slopes, and t-statistics for the means, \(t(\text{Mean})\), in parentheses. Panel B shows averages across years \((t)\) of the means and standard deviations \((\text{Std})\) of the regression variables. The time period for \(t\) is 1965 to 1992, 28 years.

### Panel A: Average Regression Coefficients and t-Statistics for the Averages

<table>
<thead>
<tr>
<th></th>
<th>(E_t/A_t)</th>
<th>(dE_t/A_t)</th>
<th>(dE_{t-2}/A_t)</th>
<th>(dA_{t-2}/A_t)</th>
<th>(dA_t/A_t)</th>
<th>(dD_t/A_t)</th>
<th>(dD_{t-2}/A_t)</th>
<th>(dRD_t/A_t)</th>
<th>(dRD_{t-2}/A_t)</th>
<th>(I_t/A_t)</th>
<th>(dI_t/A_t)</th>
<th>(dI_{t-2}/A_t)</th>
<th>(D_t/A_t)</th>
<th>(dD_t/A_t)</th>
<th>(dD_{t-2}/A_t)</th>
<th>(dV_t/A_t)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean</strong></td>
<td>-0.17</td>
<td>1.80</td>
<td>0.43</td>
<td>0.80</td>
<td>0.66</td>
<td>0.45</td>
<td>4.29</td>
<td>4.30</td>
<td>5.66</td>
<td>-1.17</td>
<td>-4.21</td>
<td>-4.57</td>
<td>4.22</td>
<td>6.63</td>
<td>8.10</td>
<td>-0.16</td>
</tr>
<tr>
<td><strong>t(Mean)</strong></td>
<td>(-2.82)</td>
<td>(2.61)</td>
<td>(2.43)</td>
<td>(3.08)</td>
<td>(12.21)</td>
<td>(5.48)</td>
<td>(7.24)</td>
<td>(3.74)</td>
<td>(6.86)</td>
<td>(-1.54)</td>
<td>(-5.94)</td>
<td>(-5.24)</td>
<td>(5.42)</td>
<td>(6.08)</td>
<td>(9.98)</td>
<td>(-2.62)</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td>-0.13</td>
<td>0.95</td>
<td>0.79</td>
<td>0.44</td>
<td>0.44</td>
<td>0.41</td>
<td>4.64</td>
<td>3.74</td>
<td>5.31</td>
<td>-0.35</td>
<td>-3.09</td>
<td>-3.61</td>
<td>4.20</td>
<td>6.39</td>
<td>6.88</td>
<td>-0.17</td>
</tr>
<tr>
<td><strong>t(Mean)</strong></td>
<td>(-2.35)</td>
<td>(2.85)</td>
<td>(7.80)</td>
<td>(4.24)</td>
<td>(8.24)</td>
<td>(5.14)</td>
<td>(7.77)</td>
<td>(3.37)</td>
<td>(6.54)</td>
<td>(-0.46)</td>
<td>(-3.90)</td>
<td>(-4.50)</td>
<td>(5.53)</td>
<td>(5.98)</td>
<td>(8.81)</td>
<td>(-2.75)</td>
</tr>
</tbody>
</table>

### Panel B: Means and Standard Deviations of the Regression Variables

<table>
<thead>
<tr>
<th></th>
<th>((V_t - A_t)/A_t)</th>
<th>(E_t/A_t)</th>
<th>(dE_t/A_t)</th>
<th>(dE_{t-2}/A_t)</th>
<th>(dA_{t-2}/A_t)</th>
<th>(dA_t/A_t)</th>
<th>(dD_t/A_t)</th>
<th>(dD_{t-2}/A_t)</th>
<th>(dRD_t/A_t)</th>
<th>(dRD_{t-2}/A_t)</th>
<th>(I_t/A_t)</th>
<th>(dI_t/A_t)</th>
<th>(dI_{t-2}/A_t)</th>
<th>(D_t/A_t)</th>
<th>(dD_t/A_t)</th>
<th>(dD_{t-2}/A_t)</th>
<th>(dV_t/A_t)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean</strong></td>
<td>0.350</td>
<td>0.076</td>
<td>0.013</td>
<td>0.019</td>
<td>0.170</td>
<td>0.255</td>
<td>0.013</td>
<td>0.003</td>
<td>0.004</td>
<td>0.021</td>
<td>0.014</td>
<td>0.006</td>
<td>0.016</td>
<td>0.002</td>
<td>0.003</td>
<td>0.371</td>
<td></td>
</tr>
<tr>
<td><strong>Std</strong></td>
<td>0.835</td>
<td>0.065</td>
<td>0.066</td>
<td>0.082</td>
<td>0.222</td>
<td>0.392</td>
<td>0.028</td>
<td>0.013</td>
<td>0.018</td>
<td>0.017</td>
<td>0.012</td>
<td>0.017</td>
<td>0.018</td>
<td>0.008</td>
<td>0.009</td>
<td>1.004</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>((V_t - A_t)/A_t)</th>
<th>(dI_t/A_t)</th>
<th>(dI_{t-2}/A_t)</th>
<th>(dD_t/A_t)</th>
<th>(dD_{t-2}/A_t)</th>
<th>(dV_t/A_t)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean</strong></td>
<td>0.001</td>
<td>0.001</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td><strong>Std</strong></td>
<td>0.008</td>
<td>0.008</td>
<td>0.008</td>
<td>0.008</td>
<td>0.008</td>
<td>0.008</td>
</tr>
</tbody>
</table>
Table III
Average Coefficients and Their t-Statistics from Estimates of Regressions (3) and (4) to Explain the Change, $d(V_t - A_t)/A_t = ((V_t - A_t) - (V_{t-2} - A_{t-2}))/A_t$

$D_t$, $I_t$, $RD_t$, $E_t$, and $ET_t$ are, respectively, dividends paid, interest expense, R&D expenditures, earnings before interest, and earnings before interest and taxes for fiscal year $t$. $V_t$ and $A_t$ are the market value of the firm and total book assets at the end of fiscal year $t$. (See Table I for details.) $dX_t$ is the change in a variable from year $t - 2$ to $t$. For example, $dI_t/A_t = (I_t - I_{t-2})/A_t$ and $d(I_t/A_t) = I_t/A_t - I_{t-2}/A_{t-2}$. The regressions are run for each year $t$ using all COMPSTAT firms with data for the year on all variables in any regression. Panel A of the table shows means (across years) of the regression intercepts (Int) and slopes, and t-statistics for the means, $t(Mean)$, in parentheses. Panel B shows averages across years ($t$) of the means and standard deviations (Std) of the regression variables. The time period for $t$ is 1965 to 1992, 28 years.

| Panel A: Average Regression Coefficients and t-Statistics for the Averages |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                 | Int             | $dE_t/A_t$      | $dE_{t+2}/A_t$ | $dA_t/A_t$      | $dA_{t+2}/A_t$ | $dRD_t/A_t$      | $dRD_{t+2}/A_t$ | $dI_t/A_t$      | $dI_{t+2}/A_t$ | $dD_t/A_t$      | $dD_{t+2}/A_t$ |
| Mean            | -0.13           | 3.46            | 0.83            | 0.16            | 0.34            | 2.69            | 2.96            | -6.16           | -2.13           | 3.29            | 4.90            | -0.14           |
| $t(Mean)$       | (-5.00)         | (6.85)          | (5.05)          | (1.79)          | (5.11)          | (2.33)          | (3.72)          | (-5.10)         | (-2.55)         | (2.68)          | (4.42)          | (-3.53)         |
|                 | Int             | $dET_t/A_t$     | $dET_{t+2}/A_t$ | $dA_t/A_t$      | $dA_{t+2}/A_t$ | $dRD_t/A_t$      | $dRD_{t+2}/A_t$ | $dI_t/A_t$      | $dI_{t+2}/A_t$ | $dD_t/A_t$      | $dD_{t+2}/A_t$ |
| Mean            | -0.12           | 2.52            | 0.59            | 0.11            | 0.32            | 3.02            | 2.75            | -4.35           | -1.56           | 2.88            | 3.82            | -0.15           |
| $t(Mean)$       | (-4.60)         | (8.40)          | (6.28)          | (1.24)          | (5.11)          | (2.71)          | (3.51)          | (-4.36)         | (-2.04)         | (2.37)          | (3.39)          | (-3.62)         |
|                 | Int             | $dET_t/A_t$     | $dET_{t+2}/A_t$ | $dA_t/A_t$      | $dA_{t+2}/A_t$ | $dRD_t/A_t$      | $dRD_{t+2}/A_t$ | $dI_t/A_t$      | $dI_{t+2}/A_t$ | $dD_t/A_t$      | $dD_{t+2}/A_t$ |
| Mean            | -0.11           | 4.13            | 1.11            | 0.00            | 0.27            | 3.77            | 3.08            | -5.88           | -0.60           | 2.29            | 0.05            | -0.14           |
| $t(Mean)$       | (-3.44)         | (6.13)          | (4.75)          | (0.03)          | (4.89)          | (2.66)          | (3.92)          | (-4.66)         | (-0.54)         | (2.31)          | (0.04)          | (-3.26)         |
|                 | Int             | $dET_t/A_t$     | $dET_{t+2}/A_t$ | $dA_t/A_t$      | $dA_{t+2}/A_t$ | $dRD_t/A_t$      | $dRD_{t+2}/A_t$ | $dI_t/A_t$      | $dI_{t+2}/A_t$ | $dD_t/A_t$      | $dD_{t+2}/A_t$ |
| Mean            | -0.10           | 2.95            | 0.80            | -0.01           | 0.27            | 3.87            | 2.78            | -3.40           | 0.29            | 1.99            | -1.18           | -0.15           |
| $t(Mean)$       | (-3.37)         | (7.39)          | (5.68)          | (-0.18)         | (4.95)          | (2.92)          | (3.70)          | (-3.87)         | (0.32)          | (2.06)          | (-0.99)         | (-3.43)         |

| Panel B: Means and Standard Deviations of the Regression Variables |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| $d(V_t - A_t)/A_t$ | $dE_t/A_t$      | $dE_{t+2}/A_t$ | $dA_t/A_t$      | $dA_{t+2}/A_t$ | $dRD_t/A_t$      | $dRD_{t+2}/A_t$ | $dI_t/A_t$      | $dI_{t+2}/A_t$ | $dD_t/A_t$      | $dD_{t+2}/A_t$ |
| Mean            | 0.107           | 0.023           | 0.023           | 0.285           | 0.363           | 0.005           | 0.006           | 0.007           | 0.009           | 0.004           | 0.004           | 0.509           |
| Std              | 1.069           | 0.084           | 0.116           | 0.414           | 0.634           | 0.019           | 0.027           | 0.018           | 0.026           | 0.010           | 0.013           | 1.558           |
| $dET_t/A_t$     | $dET_{t+2}/A_t$ | $d(I_t/A_t)$    | $d(I_{t+2}/A_t)$ | $d(D_t/A_t)$    | $d(D_{t+2}/A_t)$ |
| Mean            | 0.035           | 0.035           | 0.001           | 0.001           | 0.000           | 0.000           | 0.000           | 0.008           | 0.008           | 0.000           | 0.000           |                  |
| Std              | 0.120           | 0.163           | 0.011           | 0.011           | 0.008           | 0.008           |                  |                  |                  |                  |                  |                  |
control for expected profits, the relation between investment and the spread of value over cost is negative: holding profits fixed, an increase in assets implies a roughly one-for-one decline in the spread. In fact, all but one of the investment slopes are positive. It is not surprising that investment has marginal information about expected profits. Presumably, firms invest when future prospects are good and expected profits are high. Since all the explanatory variables are measured at \( t + 2 \) or earlier, the forward-looking change in assets, \( dA_{t+2}/A_t \), is likely to have information about profits after \( t + 2 \) that is missed by the other variables.

On the other hand, accounting rules may be partly responsible for the positive R&D slopes in the full regressions. To the extent that R&D is investment that generates multiyear payoffs, mandatory expensing of R&D means that assets are understated and \( (V_t - A_t)/A_t \) is too high. Including the R&D variables in the regressions alleviates this bias. The R&D slopes in the full regressions (2.69 to 5.70) seem too large, however, to be explained entirely by mandatory expensing. We guess that, like investment, R&D captures positive information about expected net cash flows missed by other variables.

Finally, in regressions (1) to (4), the change in value from \( t \) to \( t + 2 \), \( dV_{t+2}/A_t \), is meant to purge future changes in other explanatory variables of their unexpected components. Kothari and Shanken (1992) show that to fill this role, the signs for the \( dV_{t+2}/A_t \) slopes should be opposite to the signs for the slopes on changes from \( t \) to \( t + 2 \) in other variables. The slopes for other variables are almost always positive, and the \( dV_{t+2}/A_t \) slopes are indeed always negative. The \( dV_{t+2}/A_t \) slopes in the full regressions to explain \( (V_t - A_t)/A_t \) do not quite clear our three-standard-error hurdle, but the \( dV_{t+2}/A_t \) slopes in the full regressions to explain \( d(V_t - A_t)/A_t \) are more than 3.2 standard errors from zero. We conclude that \( dV_{t+2}/A_t \) partially purges future changes in other variables of their unexpected components, but it does not do the job perfectly.

IV. Taxes and Financing Decisions

The regressions in Tables I to III show that earnings, investment, and R&D are strongly related to the spread of value over cost. We now examine whether the control for profitability provided by these variables allows our regressions to capture tax effects in the relations between financing decisions and value.

A. Dividends and Taxes

The single-variable regressions in Table I show clearly that a good control for profitability is indeed necessary if the dividend slopes in the full regressions of Tables II and III are to identify tax effects. The hypothesis that the pricing of dividends reflects their personal tax disadvantage predicts negative relations between dividends and value. But the dividend slopes in the single-variable regressions are all positive and 3.69 to 7.61 standard errors from zero.
The positive dividend slopes in the single-variable regressions are not surprising. The level of dividends is positively correlated with the level of earnings; the average of the year-by-year correlations between \( E_t/A_t \) and \( D_t/A_t \) is 0.41. (Keep in mind that the data for individual firms have much idiosyncratic variance, so a correlation of 0.41 is unusually large.) Similarly, changes in dividends are positively correlated with changes in earnings and assets (investment); the average correlations of \( dD_t/A_t \) with \( dE_t/A_t \) and \( dA_t/A_t \) are both 0.20. Because earnings and investment are positively related to value, the strong relations between dividends and value in the single-variable regressions may say only that dividends convey information about expected profitability (net cash flows) that is also in earnings and investment.

If the earnings, investment, and R&D variables in the full regressions (1) to (4) capture the information in dividends about profitability, the dividend slopes can identify the negative personal tax effects predicted by Brennan (1970). Unfortunately, the control variables are not up to the task. In the full regressions to explain the level of \( (V_t - A_t)/A_t \) (Table I%), the slopes on current dividends and on the lagged and future two-year changes in dividends are about half those in the single-variable regressions. As in the single-variable regressions, however, the dividend slopes in Table II are positive, and all are beyond our three-standard-error hurdle. The full regressions to explain the change \( d(V_t - A_t)/A_t \) (Table III) are more successful; only two of eight dividend slopes are more than three standard errors from zero. With but one exception, however, the dividend slopes in the change regressions are positive, so again the regressions fail to produce any evidence of a negative tax effect in the pricing of dividends.

It is possible, of course, that negative tax effects in the pricing of dividends are empirically elusive because they are weak or nonexistent. There is support for this view from other sources. A negative tax effect in the pricing of dividends predicts a positive relation between expected stock return and the proportion of the expected return received as a dividend, usually proxied by the dividend/price ratio, D/P. In tests of this prediction (Black and Scholes (1974), Litzenberger and Ramaswamy (1979), Blume (1980), and Miller and Scholes (1982)), no consensus emerges, which suggests that any tax effects are weak. Moreover, Chen, Grundy, and Stambaugh (1990) argue that D/P proxies for risk as well as for dividend policy. When they control for risk, they find that D/P is unrelated to expected stock return. Fama and French (1993) reach a similar conclusion. Citizens Utilities, which pays cash dividends to one class of shareholders and stock dividends to another, provides more evidence. Its stock dividends are unusual because, although they are paid regularly, they are taxed as capital gains. A negative tax effect in the pricing of dividends predicts that the firm’s cash dividends are less valuable than its equivalent stock dividends. But Long (1978), Poterba (1986), and Hubbard and Michaely (1997) find no evidence for a negative tax effect in the prices of the two classes of stock.

The statistically unreliable slopes on dividend changes in the full regressions to explain \( d(V_t - A_t)/A_t \) in Table III are also consistent with the view that there are no negative tax effects in the pricing of dividends. Our view,
however, is that the almost uniformly positive dividend slopes in Table III, along with the reliably positive dividend slopes in the full regressions for \((V_t - A_t)/A_t\) in Table II, say that other variables do not pick up all the positive information about expected profitability in dividends. As a result, the regressions cannot identify tax effects in the pricing of dividends.

Though they fail to isolate tax effects, our dividend results are interesting. For example, the full regressions to explain \((V_t - A_t)/A_t\) say clearly that dividends have information about expected profitability missed by current, past, and future values of earnings, investment, R&D, and debt variables. It is then natural to ask whether this result is consistent with nontax stories about dividends. For example, Easterbrook (1984) argues that dividends increase value by leaving managers fewer resources to waste on bad investments. But dividend slopes around 5 (Table II) seem too large to be explained entirely by such agency benefits. Our guess is that the link between dividends and expected profitability is more direct. For example, Lintner’s (1956) classic dividend model can be interpreted as saying that firms target dividends to permanent or expected earnings. If measured earnings have transitory components, dividends have information about expected profitability beyond that contained in measured earnings (Miller and Modigliani (1961)).

Finally, our single-variable regressions to explain \(d(V_t - A_t)/A_t\) confirm event-study evidence that changes in dividends produce stock price changes of the same sign (Charest (1978), Aharony and Swary (1980), and Asquith and Mullins (1983)). But perhaps because we examine longer term (two-year) changes in dividends than event studies, the value responses we observe are larger. For example, in Aharony and Swary (1980), the response of stock prices to a dividend change of unspecified magnitude is 1.0 to 1.5 percent. In our single-variable regressions (Table I), a $1 change in annual dividends is associated with about a $10 change in value.

We see next that the evidence on the relations between debt and value gives stronger hints about tax effects than the dividend results. Still, the inferences are far from clean, and there will be a strong suspicion that, as for dividends, the tax effects of debt are obscured by imperfect profitability controls.

**B. Debt and Taxes**

The relations between debt and value in the single-variable regressions (Table I) are sensitive to how debt is measured. In the regressions to explain \((V_t - A_t)/A_t\), the slopes on current leverage, \(I_t/A_t\), are strongly negative (−10.34 and −8.85, with \(t\)-statistics below −7.0). Similarly, in the regressions to explain the change in the value-cost spread, \(d(V_t - A_t)/A_t\), the slope on the current change in leverage, \(d(I_t/A_t)\), is −8.91 (\(t = −6.42\)). These negative leverage slopes in the single-variable regressions may, however, be proxy effects. Without showing the details, leverage and changes in leverage tend to be negatively correlated with the earnings, investment, and R&D variables we use to control for profitability.

The single-variable regressions show that value does not respond in the same way to changes in debt, \(dI_t/A_t\) (the change in interest expense scaled
by the level of assets), and changes in leverage, $d(I_t/A_t)$ (the change in the ratio of interest to assets). Whenever changes in debt show up reliably in the single-variable regressions, the slopes are positive, rather than negative. Again, without showing the details, proxy effects are a possible explanation. Unlike changes in leverage, changes in debt tend to be positively correlated with the earnings, investment, and R&D variables. In economic terms, firms tend to invest more and spend more on R&D when earnings are strong. The higher investment is in part financed with more debt, but because assets increase, the additional debt does not typically show up as higher leverage.

The correlations of the debt variables with proxies for profitability say that the single-variable regressions in Table I cannot identify the tax effects of debt. The full regressions in Tables II and III have a better chance because they use earnings, investment, and R&D to control for the information in debt about profitability. Moreover, because dividends seem to have information about expected profitability missed by the control variables, the dividend variables may also help isolate the tax effects of debt.

Tables II and III show that debt slopes change a lot when other variables are included in the regressions. In the regressions to explain $(V_t - A_t)/A_t$, the slopes on current leverage, $I_t/A_t$, rise from strong negative values in the single-variable regressions (Table I) to values that are mostly within three standard errors of zero in the full regressions (Table II). In the regressions to explain $d(V_t - A_t)/A_t$, the slopes on the current change in leverage, $d(I_t/A_t)$, are also less negative in the full regressions (Table III). We infer that the stronger negative relations between leverage and value in the single-variable regressions are due to the negative correlations of leverage with the proxies for profitability.

The slopes on the changes in debt, $dI_t/A_t$ and $dI_{t+2}/A_t$, change even more dramatically in the full regressions. In the regressions to explain $(V_t - A_t)/A_t$, the average slopes go from positive ($dI_{t+2}/A_t$) or strongly positive ($dI_t/A_t$) in the single-variable regressions (Table I) to strongly negative in the full regressions (Table II). Similarly, in the regressions to explain $d(V_t - A_t)/A_t$, the slopes on the future change in debt, $dI_{t+2}/A_t$, switch from strongly positive in the single-variable regressions (Table I) to negative in the full regressions (Table III), and the slope on the current change in debt in the full regressions is strongly negative. We infer that the positive slopes on changes in debt in the single-variable regressions are due to positive correlations between changes in debt and our proxies for expected profitability.

But do the profitability controls in the full regressions allow us to identify the tax effects of debt? Recall the hypotheses. Miller (1977) argues that debt has no net tax benefits because the personal tax costs of debt just offset corporate tax benefits. In his world, there is no relation between debt and value when we control for pretax earnings; controlling for after-tax earnings, the relation is negative. In contrast, MM (1963) argue that debt has net tax benefits. In their world, there is a positive relation between debt and value when we control for pretax earnings, but there is no relation when we control for after-tax earnings.
The full regressions produce no evidence that debt has net tax benefits that enhance firm value. Whether the regressions control for pretax or after-tax earnings, almost all the slopes on the debt variables are negative. These results can be interpreted as more consistent with Miller’s (1977) hypothesis that debt has no net tax benefits. The arguments, however, are a bit strained. As Miller’s model predicts, the slopes on lagged and future changes in debt, \( dI_t/A_t \) and \( dI_{t+2}/A_t \), in the full regressions to explain \( (V_t - A_t)/A_t \) (Table II) are reliably negative and near \(-5.0\) when the regressions control for after-tax earnings. Similarly, the slopes on current changes in debt and leverage, \( dI_t/A_t \) and \( d(I_t/A_t) \), in the after-tax regressions to explain \( d(V_t - A_t)/A_t \) (Table III) are reliably negative and near \(-5.0\). But there is a problem. The debt slopes that are strongly negative when we control for after-tax earnings remain strongly negative when we control for pretax earnings. To make such results consistent with Miller’s model, one must argue that most of the variables we use to control for profitability (investment, R&D, and now dividends) are driven by after-tax profits and so in effect control for after-tax profits in all the regressions.

Our results present two additional problems for Miller’s model. First, in the full regressions to explain the change in the value-cost spread (Table III), the slopes on the future change in leverage, \( d(I_{t+2}/A_{t+2}) \), are never strong. An advocate for Miller’s model might argue that these slopes are small because future changes in leverage are unpredictable. The weak slopes for \( d(I_{t+2}/A_{t+2}) \) in the single-variable regressions to explain \( d(V_t - A_t)/A_t \) in Table I are consistent with this view. Second, the slopes on past and future changes in leverage are also weak in the full regressions to explain \( (V_t - A_t)/A_t \) (Table II). Here an advocate might argue that because leverage is mean reverting (Auerbach (1985)), the level of leverage is more informative about leverage policy than the changes. The problem with this explanation is that, although the slopes on the level of leverage, \( I_t/A_t \), are indeed negative in the full regressions for \( (V_t - A_t)/A_t \), only one of four is beyond our three-standard-error hurdle.

In short, one must stretch hard to conclude that our tests support Miller’s (1977) hypothesis that leverage has no net tax benefits that increase firm value. Our view is that imperfect controls for profitability probably drive the negative relations between debt and value and prevent the regressions from saying anything about the tax benefits of debt. Unfortunately, the situation may be hopeless. The Miller (1977) and MM (1963) models make knife-edge predictions about the signs of the debt slopes in regressions that control for before- and after-tax profitability. A clean choice between the models requires that nondebt variables provide clean controls for before- and after-tax profitability. This is probably impossible. Our controls are almost surely imperfect. And if debt has information about profitability that is missed by earnings, investment, R&D, and dividends, the resulting contamination of the debt slopes obscures any tax effects.

Many models predict that, in the absence of a perfect control for profitability, debt variables are likely to have negative slopes in regressions to explain \( (V_t - A_t)/A_t \) and \( d(V_t - A_t)/A_t \). For example, risky debt leads to
agency problems between stockholders and bondholders that can distort investment decisions (Fama and Miller (1972), Jensen and Meckling (1976), Myers (1977)). To avoid these agency problems, profitable firms with strong growth opportunities, and thus high \((V_t - A_t)/A_t\), are likely to choose lower leverage. The asymmetric information model of Myers (1984) and Myers and Majluf (1984) is also a potential explanation for negative relations between debt and value. In this model, investors know that firms tend to issue risky securities when they are overvalued. As a result, new issues meet with price discounts. The prospect of such discounts causes firms to finance investment first with retained earnings, then with debt, and only as a last resort with stock (the pecking order). One can argue that in this model, unexpected increases in debt are bad news about the prospects of firms. Miller and Rock (1985) can also be interpreted as predicting negative relations between shocks to debt and shocks to value because more debt is bad news about profits. In these models, leverage and expected changes in leverage or debt can also be negatively related to value because the debt variables are proxies for present and expected future profits.

Finally, previous empirical work does not foreshadow our evidence that debt has marginal information about value. Jung, Kim, and Stulz (1996) find that firms with high \(V_t/A_t\) are less likely to issue new debt. But their results do not imply that the relation between debt and value will remain negative in the face of the profitability controls provided by earnings, investment, R&D, and dividends. The typical finding in event studies is that changes in debt cause opposite changes in stock prices, but the price responses are small and statistically unreliable (see, for example, Eckbo (1986)). Based on the event studies, we had high hopes that the other variables in our regressions would absorb any information in debt about profitability, and would allow the debt variables to identify tax effects. Our expectations are not realized.

V. Conclusions

If we could control for the information about profitability in dividends, the dividend slopes in our cross-sectional regressions would isolate tax effects. We find no hint of a negative personal tax effect in the pricing of dividends. The relation between firm value and dividends is positive in single-variable regressions, and it typically remains positive when we use earnings, investment, R&D, and debt to control for profitability. We infer that dividends have information about profitability that is missed by reported earnings and other variables (Miller and Modigliani (1961)). As a result, any negative tax effects in the pricing of dividends are obscured by positive information effects.

The evidence that dividends convey information about value missed by earnings and other variables is consistent with models in which dividend signaling is costly (Bhattacharya (1979)). But models in which the information in dividends involves no cost will also work. For example, if measured earnings are noisy and dividends are smoothed versions of earnings (Lintner (1956)), dividends can have information about profitability.
As in the case of dividends, if we could control for the information about profitability in debt, the debt slopes in our cross-sectional regressions would identify tax effects. We find, however, that our controls for profitability tend to leave negative marginal relations between value and leverage, changes in leverage, and changes in debt. Our tests thus produce no indication that debt has net tax benefits (MM 1963).

With a stretch, the negative debt slopes in our full regressions support Miller’s (1977) hypothesis that debt has no net tax benefits. However, we think it is likely that the regressions do not fully control for the information in debt about profitability. The negative debt slopes are then consistent with what we take to be a general implication of Myers (1984), Myers and Majluf (1984), and Miller and Rock (1985): High leverage, and increases in leverage and debt, are bad news about value. At high levels of leverage, the stockholder–bondholder agency problems that arise when debt is risky (Fama and Miller (1972), Jensen and Meckling (1976), Myers (1977)) also predict a negative relation between leverage and profitability.

If the earnings, dividend, and investment variables in the full regressions do not capture all the information in debt about profitability, the regressions cannot isolate the tax effects of debt, and the debt slopes are mixes of tax, agency, asymmetric-information, bankruptcy, and proxy effects. All we can then say is that, on balance, negative information in debt about profitability overwhelms any tax (or other) benefits of debt.

Although our regressions fail in their main task, they expose a rich set of information about profitability in investment and financing decisions that, in light of existing event study evidence, is surprising. Controlling for profitability, the relation between investment and the spread of value over cost should be negative. In fact, it remains strongly positive in regressions that include earnings, R&D, dividends, and debt variables. Thus, investment has positive information about future prospects missed by the other variables. In comparison, the event study evidence says that the univariate response of stock prices to investment announcements is weak (McConnell and Muscarella (1985)). Event studies show that changes in dividends produce stock price changes of the same sign. Our regressions produce the stronger result that dividends have information about value missed by earnings, investment, R&D, and debt. And although event studies find that the response of stock prices to changes in debt is small and statistically unreliable (see, for example, Eckbo (1986)), we find negative relations between debt and value even after controlling for earnings, dividends, investment, and R&D.

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